

SODIUM HYDROXIDE

CAS Registry Number: 1310-73-2

NaOH

Molecular Formula: HNaO

Sodium hydroxide is odorless and exists as a solid or a liquid. In solid form it is a white substance available in many forms, including lumps, sticks, pellets, and chips. It rapidly absorbs carbon dioxide and water from the air, and is very caustic to animal and vegetable tissue and to aluminum metal in the presence of moisture. Sodium hydroxide can be dissolved in water, alcohol, and glycerol, and generates heat while dissolving (Merck, 1989).

Physical Properties of Sodium Hydroxide

Synonyms: Solid: caustic soda; solid caustic soda; soda lye; sodium hydrate; caustic flake

Liquid: caustic soda solution; lye solution; sodium hydrate solution

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| Molecular Weight: | 40.00 |
| Boiling Point: | 1390 °C |
| Melting Point: | 318.4 °C |
| Vapor Pressure: | 1 mm at 739 °C |
| Density/Specific Gravity: | 2.120 at 20/4 °C (water = 1) |
| Log Octanol/Water Partition Coefficient: | Too low to measure |

(Merck, 1989; Sax, 1989)

SOURCES AND EMISSIONS

A. Sources

Sodium hydroxide is used to neutralize acids and make sodium salts, for example in petroleum refining it is used to remove sulfuric and organic acids. It is also used to hydrolyze fats in the production of soaps, and in the manufacture of rayon, textiles, and cellophane.

Other uses include the manufacturing of plastics by dissolving casein, in reclaiming rubber by dissolving out the fabric, peeling fruits and vegetables in food production and in vegetable oil refining, and etching and electroplating. Sodium hydroxide also has applications in chemical and metal processing, the pulp and paper industry, disinfection, and to dehorn cattle (HSDB, 1991; Merck, 1989; Sax, 1987).

The primary stationary sources that have reported emissions of sodium hydroxide in California are pulp mills, public order and safety facilities, and manufacturers of aircraft and aircraft parts (ARB, 1997b).

Sodium hydroxide is registered as an adjuvant for agricultural use, and as an algicide for use in industrial waste disposal systems and sewage systems. The licensing and regulation of pesticides for sale and use in California are the responsibility of the Department of Pesticide Regulation (DPR). Information presented in this fact sheet regarding the permitted pesticidal uses of sodium hydroxide has been collected from pesticide labels registered for use in California and from DPR's pesticide databases. This information reflects pesticide use and permitted uses in California as of October 15, 1996. For further information regarding the pesticidal uses of this compound, please contact the Pesticide Registration Branch of DPR (DPR, 1996).

B. Emissions

The total emissions of sodium hydroxide from stationary sources in California are estimated to be at least 770,000 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information about the natural occurrence of sodium hydroxide was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of sodium hydroxide.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of sodium hydroxide was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Sodium hydroxide is expected to be particle-associated or in the aerosol form in the atmosphere, and hence subject to wet and dry deposition. The average half-life and lifetime for particles and particle-associated chemicals in the troposphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Balkanski et al., 1993; Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program. Of the risk assessments reviewed as of December 1996, for non-cancer health effects, sodium hydroxide contributed to the total hazard index in 18 of the approximately 89 risk assessments reporting a total chronic hazard index greater than 1, and presented an individual hazard index greater than 1 in 3 of these risk assessments. Sodium hydroxide also contributed to the total hazard index in 17 of the approximately 107 risk assessments reporting a total acute hazard index greater than 1, and presented an individual hazard index greater than 1 in 9 of these risk assessments (OEHHA, 1996b).

HEALTH EFFECTS

Sodium hydroxide is caustic at the site of contact whether by inhalation, ingestion, or skin contact.

Non-Cancer: Fumes or mists of sodium hydroxide are strongly alkaline. Fumes and mists are very irritating to the eyes, skin, and upper respiratory tract. Severe exposures may result in pulmonary edema. Sodium hydroxide is neutralized at the site of contact and is therefore unlikely to cause effects elsewhere in the body (U.S. EPA, 1994a).

An acute non-cancer Reference Exposure Level (REL) of 20 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and a chronic non-cancer REL of $4.8 \mu\text{g}/\text{m}^3$ are listed for sodium hydroxide in the California Air Pollution Control Officers Association Air Toxics “Hot Spots” Program, Revised 1992 Risk Assessment Guidelines. The toxicological endpoints considered for chronic toxicity are the respiratory tract and skin. The acute toxicological endpoint is respiratory irritation (CAPCOA, 1993). The United States Environmental Protection Agency (U.S. EPA) has not established a Reference Concentration (RfC) for sodium hydroxide (U.S. EPA, 1995a).

Cancer: The International Agency for Research on Cancer and the U.S. EPA have not classified sodium hydroxide as to its carcinogenic potential (IARC, 1987a; U.S. EPA, 1995a).

